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# INFORMATIONS F.I.D.

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## FORTHCOMING EVENTS

**International Conference on Scientific Information**
For details of conference plans and criteria for papers see p. 5-15 in this issue.

### Documentation of Applied Chemistry

The 2nd International Congress of Documentation of Applied Chemistry will be held in 1958, place and date are not yet decided. For further information write to Dr. R. Morf, Secretary General of the International Union of Pure and Applied Chemistry, Sandos A.G., Basle, Switzerland.

The 16th International Congress of Pure and Applied Chemistry and 19th Conference of the International Union of Pure and Applied Chemistry will be held in Paris from April 16 to 25, 1957.

### Bibliographic problems in the Pacific

At the occasion of the 9th Pacific Science Congress, to be held in Bangkok (Thailand) from November 18 to December 9, 1957, a Symposium on Bibliographic Problems in the Natural Sciences in the Pacific will be organized. Inquiries: Dr. Charug Ratanarat, Secretary General, Pacific Science Congress, Department of Science, Ministry of Industry, Bangkok.

### Printing industries

An International Exhibition of Printing Industries and Allied Trades will be held in Lausanne, Switzerland, from June 1 to 16, 1956. For further information write to the Commissariat Général, Avenue Mon-Repos 6, Lausanne.

## MEETINGS HELD

### American Documentation Institute

The American Documentation Institute held its 1956 annual meeting in affiliation with the American Association for the Advancement of Science in New York, December 28-29.

James W. Perry, director of the Center for Documentation and Communication Research, Western Reserve University, assumed the presidency of ADI, the new president elect being Herman H. Henkle, director of the John Crerar Library in Chicago. Joseph Hilsenrath as past president remains an officer of ADI for 1957. Kenneth L. Fagerhaugh of the Carnegie Institute of Technology continues as treasurer; and Charles La Hood of the Photoduplication Service, Library of Congress, is the new secretary.

Two members of ADI council are finishing their term this year: Charles F. Bernier, Chemical Abstracts; and Nell Steinmetz of the Pacific Aeronautical Library. The two newly elected members are Madeline M. Berry of the National Science Foundation and Donald C. Holmes of the Photoduplication Service, Library of Congress.

Some twenty papers were read at the meeting, including a series of three on "Language, logic, and logistics of documentation", and various contributions on automatic data processing and computers in documentation.

## VISITS RECEIVED

**Mr. Th. P. Loosjes,** Treasurer of the International Association of Agricultural Librarians and Documentalists, c/o Centrum voor Landbouwdocumentatie, Wageningen, Netherlands, visited the General Secretariat on January 8, 1957, to obtain information on accounting practice of an international body.

**Prof. Dr. H. R. Kruyt,** Chairman of the ad hoc Advisory Committee on Abstracting and Documentation of the International Union of Pure and Applied Chemistry, visited the General Secretary on January 22, 1957, to discuss co-operation with FID.

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## UNIVERSAL DECIMAL CLASSIFICATION

### Proposals for extension of the UDC

PE 610 (13 February 1957) Comments up to 13 June 1957. Primarily corrections to earlier PE Notes (PE 598, 603, 606, 607 and 609). References in consequence of cancelling 621.34 are proposed. A British proposal for 64.034 supplementary to PE 602. A Finnish proposal for 656.146 replacing PE 602.

## MISCELLANEOUS

### Council on Documentation Research

In the belief that co-operative action is necessary in all fields of learning in order that recorded knowledge may be made more readily available to those who need it, representatives of a number of professional, industrial, governmental, and educational organizations in the USA have voluntarily associated to form a Council on Documentation Research, with the following purposes:

1. to promote understanding among those who produce, organize and use recorded knowledge of all types in all fields;
2. to assist in the identification of clarification of problems common to those who produce, organize and use information in diverse areas;
3. to promote research and development in documentation;
4. to encourage exchange of information concerning developments in principles, systems, and equipment for the effective organization of graphic records.

The membership of the Council comprises organizations and institutions actively concerned with the production, organization, or use of knowledge. The officers are: President: Donald D. Andrews, Director of the Office of Research and Development, U.S. Patent Office, Executive Secretary: Jesse H. Shera, Dean, School of Library Science, Western Reserve University, Cleveland 6, Ohio, USA.

### Nordforsk

The Nordic Delegation for Coordinating Technical-Scientific Research (Nordiska samarbetsdelegationen för tekniskt-vetenskaplig forskning - Nordforsk) was formed in 1946 to further co-operation between the central research organisations in Denmark, Finland,

Iceland, Norway and Sweden and to maintain constant contact between them. The delegation consists of presidents or chairmen and secretaries of the academies and national research councils in the field of engineering sciences who bi-annually meet at plenary sessions.

The current work is carried out by the central contact men for the Nordic countries, namely
in Denmark by Mr. Bjerre Lavesen, Secretary of the Danish Academy of Technical Sciences (ATV), Øster Voldgade 10, Copenhagen K.
in Finland by Prof. Edward Wegelius, Director General of the State Institute for Technical Research, Lönnrotinkatu 37, Helsinki
in Norway by Mr. Robert Major, Director of the Royal Norwegian Council for Scientific and Industrial Research, Jernbanetorvet 2, IV, Oslo.
in Sweden by Mr. Gösta Lagermalm, Secretary of the State Council of Technical Research, Grevturegatan 14, Stockholm 5.

Prof. Edy Velander, Director of the Royal Swedish Academy of Engineering Sciences (IVA), Box 5073, Stockholm 5, is Secretary General of the Delegation. Recently Miss Elin Törnudd was appointed joint secretary.

Documentation is one of the most important items in the working program of Nordforsk. The contact in documentation is formed by the heads of Technical Information Centers in each country:
in Denmark Mr. Kjeld Klintøe, Danish Technical Information Service, Øster Voldgade 10, Copenhagen K.
in Finland Mrs. Eeva Wartiovaara, State Institute for Technical Research, Lönnrotinkatu 37, Helsinki
in Norway Mr. Per Bjørnstad, Royal Norwegian Council for Scientific and Industrial Research, Committee for Technical Information Services, Blindern
in Sweden Mrs. Kajsa Hellström, Royal Swedish Academy of Engineering Sciences, Box 5073, Stockholm 5.

*Acta Polytechnica* published since 1947 by the Royal Swedish Academy of Engineering Sciences (IVA), and known as a significant series of original contributions to the engineering sciences, is being developed into a joint Scandinavian publication. The same applies to IVA's *Tidskrift för teknisk-vetenskaplig forskning* which contrary to *Acta Polytechnica* aims at broad reporting on its field.

**Technical University Libraries**

An International Association of Technical University Libraries (IATUL) was founded in May 1955 by the International Federation of Library Associations as one of its sections. The Association now consists of 35 members from 16 countries.

The first annual meeting was held in Munich in September 1956. The meeting elected the following officers for the coming year: President, Dr. E. Hemlin, Chalmers Tekniske Högskola Bibliotek, Gothenburg, Sweden; Vice-President, Dr. P. Scherrer, Zürich; Secretary, Dr. W. Grunwald, Hanover; and Treasurers, Dr. L. J. van der Wolk, Delft, and Dr. W. Schmitz, Aachen.

A short report on the proceedings at the first annual meeting was published in "Informations FID", November 1956, p. 50.

**Bibliographical strip**

ISO Council has decided in November 1956 to accept as ISO Recommendation the Draft ISO Recommendation no. 31 prepared by ISO/TC 46 "Documentation" and approved at its meeting in Brussels in 1954.

The new ISO Recommendation has been registered under the reference ISO/R 30 - Bibliographical strip; it will be published shortly.

The bibliographical strip is a concise summary of bibliographical reference data, printed at the foot of the front page of the cover of a periodical. It contains the following data in the given order: abbreviated title (see ISO/R4), volume number, issue number, pagination of issue, place of publication, date of publication (day, month, year).

Copies will be available at the national standardization bodies.

**Centre International de la Photographie Fixe et Animée**

Les voeux des Rencontres Internationales ont aboutis essentiellement à fixer deux buts:

1. Etablir des relations et des échanges internationaux entre tous les intéressés aux questions de la photographie fixe et animée: utilisateurs, techniciens, fabricants, producteurs, etc.
2. Mettre en oeuvre une action de diffusion de la photographie comme moyen d'expression universelle, comme véhicule de la culture et de l'enseignement, et comme moyen de coopération entre les peuples.

Le Comité technique du Cinéma et de la Télévision a réalisé des travaux ayant abouti à étudier la constitution d'un Institut International du Cinéma et de la Télévision.

Le Secrétaire Général du Centre est Mr. P. Sonthonnax, 116 bis Champs-Elysées, Paris 8e, France.

## PERSONALIA

**Dr. Alexander King,** President of FID, has per January 1957 been appointed for at least one year as Deputy Director of the European Productivity Agency of OEEC, 3 rue André Pascal, Paris 16, France.

## CIRCULAR LETTERS

F57-1 (3.1.57): News release on the International Conference on Scientific Information, Washington 1958.
F57-2 (9.1.'57) Proposed composition of the new panel for UDC Textiles and its subcommittee for 667.0/.3. National members, who have not yet done so, are requested to appoint their delegates.
F57-3 (15.1.'57): letter to congressists who attended FID meetings in Brussels 1955, indicating "Informations FID" as news source.
F57-4 (22.1.'57): Report on revision of UDC 615.
F57-5 (31.1.57): Provisional accounts per 31 December 1956 and estimate of budget for the year 1957.

*Informations FID* is a monthly supplement to the quarterly journal *Review of Documentation*, issued by the International Federation for Documentation.

Subscription rates per year for the *Review of Documentation* incl. "Informations FID" and the Cumulative Bibliography of Documentation and Library Science 19,- Dutch guilders, without the Cumulative Bibliography 15,- Dutch guilders. Forwarding expenses (excl. the Netherlands) 2,- Dutch guilders.

Subscription rates per yaer for the *Informations FID* as a separate subscription 5,- Dutch guilders, incl. forwarding expenses.

# International Conference on Scientific Information

**to be held in Washington in November 1958 (As announced in Inf. FID 6 no. 12, Dec. 1956)**

## *Conference plans and criteria for papers*

Participation in the Conference will be limited to specialists in the fields covered by the agenda. These will include authors of papers accepted for inclusion in the Conference program and members of Review Panels, which are the working panels, designated to lead the discussion of papers in each working area. Individuals may serve both as authors and as members of Review Panels, except that authors may not serve on Review Panels in areas covered by their own papers. In the interest of effective discussion it is believed that the number of participants must not exceed 150. (This includes authors and members of Review Panels). Observers will be encouraged to attend the Conference; however, they will be asked to register in advance.

In the interest of a well-balanced and fruitful Conference, final authority for accepting papers for the program has been vested by the sponsors in a Conference Committee. This Committee, through the Secretariat, will call on the services of the most highly qualified experts throughout the world to referee all papers submitted.

The criteria that have been adopted for papers to be included in the Conference program include:

1. Papers will deal with work that has not been published or presented at any open meeting. Work will be considered to have been published if it has been reproduced for general distribution in any form or if copies have been deposited in libraries where they are available to the public.
2. Papers will be directed to specialists in the field covered. Only sufficient background information will be included to serve as an adequate framework for new work described in the papers. More general background material will be indicated by references.
3. Papers dealing with systems and methods will describe these at length only when they have not been described previously. If new methods or systems are involved, these will be described in sufficient detail to enable other qualified workers to duplicate the procedures and the results. There will be sufficient information to enable qualified readers to judge the validity of results in objective terms.
4. Theoretical papers will clearly explain the factual basis from which theoretical conclusions have been drawn and will point the way to experimental methods of verifying predictions which follow from such theoretical conclusions.

Within this framework the Conference Committee invites contributions to the Conference program from workers anywhere in the world who are interested in presenting papers in any of the areas covered by the Agenda of the Conference. Attendance at the Conference will not be prerequisite for acceptance of an author's paper; however, efforts will be made to assist interested authors to attend the Conference.

All proposals for papers must first be submitted in outline form and at the very earliest possible date.

Papers accepted for inclusion on the Conference program will be printed and distributed to all participants at least two months in advance of the Conference date so that they will not need to be read in their entirety at the Conference. Instead, they will be presented in brief outline for discussion by review panels of experts and by all interested participants in the Conference.

The papers and an appropriately edited account of the discussions at the Conference will be published in book form as the Proceedings of the Conference on Scientific Information.

### AREA 1

*Requirements of scientists for scientific literature and reference services; knowledge now available and methods of ascertaining their requirements.*

PROPOSED DEFINITIVE STATEMENT: SCOPE OF THE GENERAL AREA

In order to improve the dissemination of scientific information and to design more effective reference tools and services, we need to have a more complete understanding of the weaknesses and strengths of the present pattern of scientific communication and, in particular, of the unfilled or inadequately filled needs of scientists for information. It would be helpful first to have a summary of the views of a number of representative scientists in different fields concerning their own information requirements and problems; and then to review the information yielded by studies of the use of scientific literature and by surveys of various types and to attempt to identify some of the needs suggested by the results of such studies. It is to be expected, however, that a review of past and present studies will point up the need for much additional and more objective knowledge

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about information practices and needs. Methods by which this knowledge can best be obtained should be considered, both by evaluating the results obtained with the methods that have been tried and by discussing the potential usefulness of other methods that have yet to be applied to this problem.

A few examples of the studies that have been made will serve to illustrate the methods that have been used to date. Dwight Gray and Bentley Glass have made questionnaire surveys in the fields of physics and biology respectively in order to determine how abstracting services are used, the degree of satisfaction with present services, and the express desires of scientists for improved services. As a part of the recent survey of the physiological sciences, the Survey Research Center of the University of Michigan included in a widely distributed questionnaire questions concerning the use of journals and bibliographical publications and the extent to which physiologists believe they are able to keep up with developments in their fields of specialization.

Interviews have been used by Saul Herner in an effort to discover from research scientists just how they look for and obtain information, what publications and library services they use, and the extent to which they do their own searching or rely on the help of librarians and information specialists.

A number of studies have made use of the "reference counting" method. Perhaps the best known of these was a study by Herman H. Fussler to determine the characteristics of the research literature used by chemists and physicists in the United States, the forms and national origins of the literature used, the importance of various subject fields, the temporal span, and the most important journals for each field. Most studies of this type purport to identify the important publications. Estelle Brodman, on the other hand, has attempted to assess the validity of the "reference counting" method by asking a number of individual investigators to rate the publications most useful to them in order of their importance. She found little or no correlation between the results obtained by means of these two approaches.

A "current use" study was made by D. J. Urquhart, prior to the Royal Society Scientific Information Conference, in which the users of periodicals and books circulated by a science library were asked to fill out a brief questionnaire explaining where they had learned of the publication, whether it contained the desired information, and for what the information was needed.

The diary method was first used by J. D. Bernal in a study reported to the Royal Society Scientific Information Conference. He asked working scientists to keep detailed records of what they read, why they read it, and what use they made of the information. The validity of the method has recently been investigated in a pilot study at the Forest Products Laboratory, Madison, Wisconsin, under the direction of Ralph R. Shaw.

D. B. Hertz and A. H. Rubenstein have investigated communication in team research, including the flow of information among members of research groups and the use of outside sources of information. Communication difficulties experienced by the groups were studied by means of interviews. The report of this investigation includes a discussion of methodology, the value of the case-study approach versus short data-gathering visits to organizations being studied.

As for current projects that are trying still different methods, Russell Ackoff, Case Institute of Technology, has directed a study of the feasibility of using the techniques of operations research to obtain objective data concerning the role of information in the research process and the way in which scientists locate and use information. A full-scale study is now being planned that will employ a technique of observation to determine how much time is spent with the literature and which primary and secondary publications are used most extensively. Charles Y. Glock, Bureau of Applied Social Research, Columbia University, is initiating a project to test the value of interviews in depth conducted by skilled interviewers in eliciting from scientists on the staff of Columbia University information concerning their satisfactions and dissatisfactions with the present situation and any problems they have in keeping up with recent advances and in locating specific information when needed.

A summary or, if possible, a synthesis of the results of all these and other studies would bring out the areas of agreement and of disagreement among them. For example, Urquhart, in his study of the current use of library materials, found that abstracts were the main source of information about the publications requested. Shaw, on the other hand, in his recent study based on diary records, found that abstracts stimulated a surprisingly small percentage of the requests for publications. The two studies were carried out in quite different environments, and undoubtedly there was some difference in the subject fields in which the two groups of scientists were working. Nevertheless, this difference in the findings suggests an area for further exploration.

Perhaps the greatest need is for methods that will produce truly objective data that will help to define the current information problems and place them in proper perspective. Important as it is to have the views of research scientists about the adequacy of our present services, they themselves are usually not in a position to know how good a job an information service is doing unless they have had the time to study it carefully. For example, Glass found that 87 per cent of the biologists who participated in his survey regarded the coverage of *Biological Abstracts* as "satisfactory." Glass comments, "This opinion can only arise from a gross misconception of the true state of affairs .... It is clear that users .... have little idea of the extent of the gaps and omissions in the abstracting of the periodicals supposed to be covered, or of the vast majority of scientific periodicals with biological material that are not covered at all."

Numerous suggestions have been made for other types of studies that might add to our understanding of information problems and point the way toward improvements most urgently needed, such as:

1. Case studies of actual research projects to determine the role of scientific literature in research, the time given to it, the way it is used, etc.
2. Collection of data on specific instances in which time and money were wasted because information was not readily available, in particular, instances of undesirable duplication of research.
3. Study of reference questions put to information centers to determine just what information the scientists are seeking in specific instances; also further study of "unanswered questions." A British study of questions to which researchers could not find answers suggested that the subject indexes to our abstract journals are inadequate.
4. Studies of the results obtained and changes in the work habits of scientists in situations where skilled information assistance and mechanized searching services are provided.
5. Investigation of the efficiency with which individual scientists use the available facilities to keep up with advances in their own and related fields and to locate specific data when they need it. A corollary study might inquire how the best informed persons in their respective fields manage to keep up with all that is reported in the literature and to keep track of what has been done in previous years.
6. A psychological study to determine just how persons get information from reading.
7. Exploration of the validity of the hypothesis that the creativity of a scientist is related to the breadth as well as the depth of his knowledge.
8. Exploration of the amount of time it is worthwhile to spend in a literature search in various special fields.
9. Assignment of the same research problem to two different groups, one to have skilled assistance with the literature and the other no special assistance, in order to compare the courses of the work of the two groups.

It is probably correct to say that up until now scientists have been concerned for the most part with maintaining and improving their journals of primary publication and with obtaining better abstracts, indexes, and other bibliographic services, with considerable discussion in recent years of the desirability of faster, mechanized search procedures. It may be, however, that if we had a more complete understanding of the information requirements of research scientists, we would place more emphasis on another aspect of the total picture, such as the preparation of more first-class reviews that synthesize new knowledge and draw attention to the areas where more work is needed. As the volume of the scientific literature continues to increase and as bibliographic and search processes are made more efficient and comprehensive, the quantity of relevant literature on any one topic will become larger. The sheer time required even to scan large numbers of publications identified in a literature search suggests that it is becoming more and more important to find means of reducing to manageable proportions the large quantities of information scattered in many different sources. The problem of reviews will undoubtedly be discussed in Areas 2 and 3, but in this portion of the agenda it might be fruitful to consider requirements for review publications or for other means of "data reduction"; and then in the succeeding areas to discuss ways and means of encouraging their preparation and possible experiments to test their value and the extent to which a good review can, for certain purposes, supersede a large number of primary publications.

SUGGESTED WORKING PAPERS

Present knowledge of information requirements

1. Summary of information requirements and problems of scientists in the various fields. This summary might be based on individual statements to be contributed by representative scientists in each field or, alternatively, on informal surveys to be conducted with the aid of interested scientific societies.
2. Summary of findings to date on use of information by scientists.
3. Results obtained through the provision of highly skilled literature scientists as participants in research and deductions concerning information needs.

Methodology

1. Interviews and surveys to determine information practices and attitudes.
2. The diary method and other types of record keeping on uses of information.
3. Analysis of reference questions and "unanswered questions" to help to determine information needs of scientists.
4. Case studies and other methods of determining the role of recorded knowledge in research.
5. Operations research in the area of scientific communication.

## AREA 2

*The function and effectiveness of abstracting and indexing services for storage and retrieval of scientific information.*

PROPOSED DEFINITIVE STATEMENT: SCOPE OF THE GENERAL AREA

For a science to become and remain completely healthy, information which one scientist discovers or develops must be available under "controlled conditions" to any other scientist who wishes to obtain it — whether to apply in his own research, to use in teaching, or simply to keep informed of progress in the field. ("Controlled conditions" as used here means merely a system of processing and storage that permits ready identification of and access to desired information. It has no implications of granting or refusing permission to obtain information). The principal system that has been evolved over the decades for the accomplishment of this goal has as its chief components the journals of original publication, abstracting and indexing services, and reviews — in

short, the media of primary and secondary publications.

From one point of view primary publication is an early stage in the process of storing scientific information. However, the primary reason for publishing scientific journals, laboratory reports, and other first accounts of research work is to disseminate scientific information — not to store it. The steady and relatively unorganized growth of primary publications in recent years has greatly increased the scope and complexity of the storage and retrieval problem. With reference to secondary publications, abstracts, indexes, bibliographies, and so forth, some scientists look upon these primarily as guides to current publication; for other scientists, however, they are primarily storage and retrieval devices. This Conference will devote most of its attention to the latter aspects of secondary publications although some consideration will undoubtedly be given to the function of disseminating information because all of these functions are so closely related.

Of course there are many kinds of abstracts and indexes. Some are comprehensive, such as *Chemical Abstracts;* some are specialized, such as *Petroleum Abstracts*. There is a great deal of difference in services and in coverage. For example, Gray and Bray found over 150 abstracting services that appeared to be of interest to physicists. On the other hand, many areas are not served at all, at least in the English language. For example, there is no abstracting or indexing service in English in the fields of geophysics or astronomy.

The existence of satisfactory abstracting and indexing services seems to depend in the first instance on the money available. Thus the fields of chemistry and medicine are very well served. Accidental factors in historical development may also play an important part. Chemists are served by an abstract journal, whereas engineers rely primarily on index cards. It would be interesting to examine the question to ascertain whether this difference really grows out of a difference in needs, or whether it is primarily a historical accident.

There are a number of approaches to the problem of supplying complete abstracting and indexing services for a field. One is to establish a centralized service like the All-Union Institute of Scientific and Technical Information of the Academy of Sciences of the USSR. A second is the approach adopted by the ICSU Abstracting Board. A third is to establish specialized services employing professional abstractors. The Russian Institute states that it furnishes complete coverage of science on the basis of 10,000 journals. From these 10,000 journals they prepare 400,000 abstracts, which is to be compared with 80,000 that *Chemical Abstracts* prepares on the basis of covering 7,000 journals. The Russians agree with the *Chemical Abstracts*' decision that professional abstractors should not be used, and employ 13,000 working scientists to prepare the abstracts. The abstracts may appear in any or all of the 13 abstract journals issued by the Institute. Abstracts may be prepared specially for the appropriate abstract journal where this appears necessary, or they may be duplicated in the different journals.

The ICSU cooperative program encourages the use of author abstracts. Every effort is made to achieve promptness by making special arrangements with scientific journals to furnish advance proofs of articles. There are many examples of small or specialized services using professional abstractors.

It appears that it would be very interesting to compare the advantages and disadvantages of all these approaches from the standpoint of cost of the service, promptness, quality of abstracting, and so forth.

## PRINCIPAL TOPICS FOR DISCUSSION

Research into a number of aspects of abstracting and indexing services is needed. Among typical problems that may be examined at the Conference are the following:

1. What measures of effectiveness can be devised to determine the adequacy of abstracting and indexing services as storage and retrieval devices? It might be noted here that a study by the Department of Scientific and Industrial Research, based on their collection of questions that could not be answered readily by a search of the literature, has indicated that although a very large proportion of the important papers are covered by the abstracting services, many of them cannot be located because of inadequate subject indexing. This whole problem of providing adequate subject approaches to abstracting journals, or any other medium for storing information, should be given special study.
2. What measures of effectiveness can be devised to evaluate the differences between indexes, lists of annotated titles, various types of abstracts (descriptive, indicative, and critical), and reviews, in terms of the information carried and the effort involved in their preparation and use?
3. What is the optimum amount of information that should be contained in abstracts and indexes to render them effective as storage and retrieval devices, and upon what variables does this optimum depend? For example, ease of use, completeness, cost of preparation, speed of appearance, type of scientific field, and so forth.
4. What useful new services might be developed based upon the existing resources presently available at abstracting and indexing services' These might include film editions coded for use with rapid scanning devices, coded tapes, special reference service for requestors, and so forth. Also, how can the cost of these services relative to their value to requestors be determined?
5. What are the advantages and disadvantages of a centralized organization such as the All-Union Institute of Scientific and Technical Information of the Academy of Sciences of the USSR? To what extent can duplication in scanning be eliminated? To what extent can multiple use of abstracts be made among disciplines, and to what extent must duplicate abstracts be prepared? What cost data is available on scanning, prepara-

tion of abstracts, editing, and so forth, under such a system?

6. In comparison with No. 5, what are the advantages and disadvantages in terms of the scientific effort involved in a cooperative program using author abstracts along the lines of the ICSU Abstracting Board experiments? A study of the ICSU Abstracting Board's cooperative program for preparing abstracts in the field of physics should throw some light on this.
7. What is the effect on storage and retrieval systems, especially mechanized systems but also manual systems, of variations in vocabulary among abstractors and from field to field in interdisciplinary areas such as instrumentation?
8. To what extent are abstracts now regarded as means of dealing with the foreign language problem?
9. Is there any feasible method by which the abstracts and indexes prepared in one field of science might identify information (e.g. instrumentation or mathematical techniques) useful in another field?

## AREA 3

*Effectiveness of scientific monographs, compendia, and specialized information centers in meeting the need of scientists; present trends and new and proposed techniques and types of services.*

PROPOSED DEFINITIVE STATEMENT: SCOPE OF THE GENERAL AREA

In this area, perhaps more than in any other, one finds a great disparity in the scientific information services and facilities that are available in various disciplines. Many of these differences result from basically different characteristics and problems of the various sciences. Others, however, seem to stem from a lack of organization, experience, or perhaps awareness of the feasibility of adequate bibliographic control.

In some areas of science, reviews are in their infancy. In medicine, however, the volume and importance of reviews have been sufficient to stimulate the preparation of a *Bibliography of Medical Reviews*. Some reviews are little more than indexed or annotated bibliographies, whereas others provide more detailed treatment of narrow fields, and a few, such as *Nutrition Reviews*, attempt a highly critical appraisal of recent work, both individually and collectively, with a view to influencing the direction of future research.

In the matter of compendia there is also a marked difference between fields. A brief search of the chemistry collection at the National Bureau of Standards Library revealed approximately 50 compendia. Yet a search of compendia, similarly defined, in physics yielded barely a dozen titles.

Increased research activity has meant not only increased publication but also more activity in establishing specialized centers for the collection, correlation, and dissemination of scientific information. The classic compendia (*Beilstein's Handbuch der Organischen Chemie, Gmelin's Handbuch der Anorganischen Chemie, International Critical Tables*, etc.) are now out of date and it is doubtful indeed whether their revision, even on a much augmented scale, will meet future or even current needs. The Landolt Börnstein tables are now being revised in approximately the same format, but the Gmelin Institute is undergoing a significant reorganization — away from compendia and toward reference service. Compendia and reviews have played an important part in the conduct of scientific work and will undoubtedly continue to do so. In many specialized areas, nevertheless, more expeditious collection and more prompt and direct dissemination is required. Here specialized centers or organizations have been established. Some examples of such United States centers are:

The Chemical-Biological Coordination Center
Snow-Ice and Permafrost Research Establishment
Bio-Sciences Information Exchange
American Petroleum Institute Project 44
Manufacturing Chemists Association Project
Committee on Spectral Absorption Data
Nuclear Data Project
Solid Propellants Information Agency
Liquid Propellants Information Agency
Bibliography Section T.I.D., Library of Congress
Thermophysical Properties Research Center, Purdue University
Human Relations Area File
Historical Records Project, George Washington University
Linguistic Center, Indiana University
Collection of Survey Materials, Columbia University, etc.

A number of specialized European centers are interesting in this connection. Some examples are:

Gmelin Institute
Centre de Documentation, CNRS, Paris
Centre de Documentation, IRSID, Saint-Germain
Dokumentation der Molekül-Spektroskopie, Weinheim
All-Union Institute of Scientific and Technical Information, Academy of Sciences, USSR

It is to be expected that such centers will be the first to apply the latest techniques in rapid collection, search, coordination, and dissemination. It is also probable that these centers will expand their services as these new techniques become available. While much of the change may be in the direction of increased and streamlined reference services, a significant increase is to be expected in published abstract bulletins, bibliographies, and technical compendia.

It will be important, therefore, to discuss fully the organizational, economic, and technical characteristics of these specialized information centers with particular reference to the impact of machine technology on the organization and services of such centers.

This working area should be directed to the following problems:

1. Summary of studies already made of book publication patterns, existing compendia in the ma-

jor branches of science, and features of existing specialized documentation centers.
2. Evaluation of the effectiveness of a number of typical specialized services.
3. Assessment of these services in terms of new and proposed techniques (such as mechanized searching systems) and types of services that might be established.

SUGGESTED WORKING PAPERS

1. Characteristics and effectiveness of the monographic literature: A review of the role of scholarly monographs in the utilization of scientific information. The paper should include a discussion based on studies of the way scientists in various fields depend on the monographic literature as contrasted with periodicals.
2. Scientific reviews in the natural sciences: A study and analysis of the development, trends, objectives, and effectiveness of the review literature in the various natural sciences.
3. Reviews in the medical sciences: See item 2 above. The *Bibliography of Medical Reviews* should provide a good starting point for the analysis.
4. Survey and analysis of existing compendia in the physical sciences: The *Index of Mathematical Tables* by Fletcher, Miller, and Rosenhead and the quarterly *Mathematical Tables and Other Aids to Computation* which supplements it provide an excellent example of what can be done to keep track of an evergrowing collection of data. The need in the physical sciences has been recognized for some time.
5. Survey and analysis of existing compendia in the medical and biological sciences.
6. Papers outlining in considerable detail the objectives, organization, staff, facilities, operation, financing, services, effectiveness, and future plans of various information centers.
7. A directory and an analytical summary of services provided by specialized information centers in the United States.
8. A directory and an analytical summary of services provided by specialized information centers abroad.

## AREA 4

*Organization of information for storage and search: comparative characteristics of existing systems.*

PROPOSED DEFINITIVE STATEMENT: SCOPE OF THE GENERAL AREA

The dissemination of information to serve the needs of the scientific community, the institutions of learning, and the public requires orderly procedures and systems that will make scientific communications widely available,that will promote awareness of what is available, and that will provide prompt access to any desired information.

Many different systems are in existence for organizing, storing, and searching scientific information. These systems range in size from the small collections maintained by an individual to the very largest libraries; in degree of organization from those arranged only by random order of accession to those involving highly specialized classification, indexing and coding schemes; and in methodology from simple hand operations through large manual systems such as card catalogs to special collections that are partially mechanized. All of these systems are effective to some degree for some particular local use.

It is one of the major objectives of this Conference to encourage the preparation of papers that will meet a high standard of scientific method in the study of existing and proposed systems for the processing, storage, and search of scientific information. Descriptions of procedures should be sufficiently detailed to enable a competent specialist to repeat the procedure and obtain the same results; and disclosures and evaluations of methods, equipment, and systems should be given objectively in sufficient detail to permit both understanding and appraisal by others competent in the field.

Similarly, the comparative analysis of the relative advantages and disadvantages of various systems for different uses should be based upon objective consideration of the efficiency, capabilities and limitations, and costs of such systems considered in the full range of operations from accession through storage to making the desired information available.

Such objective accounts of the characteristics of existing systems (including any mechanisms used) will provide the necessary basis for the design of more effective reference tools, for the development of new and improved equipment to facilitate information storage and search, for the definition of performance requirements, and for the realization of improved systems.

This working area may be directed toward the following problems:

1. Preparation of objective accounts of systems that have been tried, including specific data on efficiency, capabilities, limitations, and costs for all phases of storage and search operations, and including operating characteristics of machines, storage media, and methods used.
2. Comparison of systems in terms of costs, efficiency, and functional characteristics where more than one system has been used for the same type application.
3. Development of criteria for the comparison of systems. These criteria should incorporate both user and administrative requirements, including relationships to other aspects of information services.

It is recognized that seldom will it be possible to obtain actual comparative studies involving two or more types of information system used for the same collection. The conference committee urges that interested individuals undertake such studies wherever possible. However, it is thought that carefully detailed studies of individual systems can be used as the basis for comparative analysis of the advantages and disadvantages of these various systems. These studies should include common factors pertinent to comparative performance evaluation.

Such common factors will probably include, but not be limited to, the following:

1. Characteristics of the collection: size; rate of growth; whether general or special purpose; number of fields covered; variety of fields covered; extent of coverage in field(s); whether acceptance of new items is controlled (e.g. technical library vs. ASTIA), etc.
2. Accessioning and cataloging: skill and training required of personnel who receive and identify new items; kind and number of accession registers or listings maintained; kind and number of listings, abstracts, etc. resulting from identification that are made available to users; minimum rate at which identification must proceed to prevent increasing backlog; tolerance for delay in making new items available to users, etc.
3. Classification and indexing: skills and training required of personnel who classify and/or index items; type of classification system used and whether hierarchical; depth of analysis; whether classification and index terms indicate relationships between subject content elements; open-endedness of system; extent to which different levels of analysis are used; number of classification categories; average number of items per category; range of items per category; provisions for increasing or decreasing numbers of categories in terms of numbers of items falling in a category; time required to determine proper category of a typical item; cost per item of classification and identification processes; similar considerations for indexing, etc.
4. Search entries: skills and training required of personnel who encode search entries, of personnel who inscribe search entries; procedure used in encoding; type of coding system; number of search terms available; average number of search terms used per item; number of character spaces required per search term and whether system uses dedicated space; space available per item for pertinent search terms; extent of redundancy in code terms; whether search entries indicate structure and interrelationships between search elements; extent of cross-referencing; whether cross-references require or permit multiple entries of item information; time required to encode all search entries for an item; cost of encoding search entries for an item; tolerance for errors in encoding; techniques used in inscribing search entries; time to inscribe; costs of inscribing; tolerance for errors in inscribing, etc.
5. Storage of items: total storage capacity required for collection; density of storage (items per cubic foot, items per unit of storage medium); characteristics of storage media; whether storage homogeneous as to media; whether storage compartmentalized; whether storage locations or locator symbols are related to classification or indexing system; cost of storage; time to store an item, etc.
6. Storage of search entries: whether combined with storage of items; total storage capacity required; density; media used; whether media erasable and reusable; whether compartmentalized; cost; time to store an entry, etc.
7. Formulation of search questions: whether special knowledge of classification, indexing, and coding schemes is required to formulate questions; kind of people who interrogate system; tools available to assist searcher in framing his question; whether question must be encoded or inscribed before processing; time required to formulate questions; time required to encode or inscribe questions, etc.
8. Search procedures: technique(s) used in conducting search; whether search must be of all entries or of entries in most probable fractional sections; access time; search rate per unit time; time to complete a typical search; whether more than one search may be conducted at one time; whether more than one section of search entries can be searched at one time; typical number of searches required to be conducted in a given time; time required to set up a new search; delay allowable before searches are conducted; average number of entries searched before search is complete; cost of conducting a search; variety and number of search types; level of recognition logic required; limit on number of search elements that can be compounded into single question; what portion of search entry must be searched in order to make selection and whether screening devices used; ease of broadening or narrowing question as search results are inspected; extent to which search procedure is self-organizing; extent of intercommunication between searchers and system during progress of search, etc.
9. Search results: output of the search (listings of locator keys, listings of titles, abstracts, informations items, facsimiles of information items); whether results are adequate; average number of omissions; tolerance for omissions; "browsability"; whether results are relevant in terms of average number of extra selections and tolerance for extra selections; resolving power; whether association reference trails are provided; provisions for repetition of search; time and costs of getting from output to desired end-results, etc.
10. Retrieval from storage: techniques for retrieval of items from storage; form of item as retrieved (original, copy, excerpt); access time; cost of reproduction if any; whether original physically removed; tolerance for delays in accessibility due to prior retrieval or reproduction; time to restore removed items to storage; cost of restoring removed items to proper place; number of items to be retrieved in a given time, etc.
11. Revision of system: ease of adding new items to collection or of replacing obsolete items; extent to which reclassification becomes necessary and at what time intervals; effort required to effect partial or complete reclassifications; effort required to re-encode entries for items reclassified; time required to make changes in classification, indexing, and coding schemes; cost of making such changes; effort required to insert new or revised search entries into system; effort required

to reorganize compartmentalization or fractionation of storage; capabilities required of personnel or mechanisms in putting changes into effect; tolerance for use of dual systems during reorganization or reclassification; extent to which machines used for search and/or retrieval maintain statistics on actual use; extent to which storage system is self-organizing, etc.

Since not all of these factors are of equal weight, and since some are more pertinent in some situations than in others, it is requested that studies of existing systems should also reflect which factors are most critical and which are less essential in the particular situation reported.

The analysis of existing systems in terms of specific characteristics and of factors common to information storage and search systems in general should thus yield criteria by which systems can be evaluated in the future as to effectiveness in any given situation.

RECOMMENDATION FOR A QUESTIONNAIRE SURVEY

The Advisory Group recommends that a questionnaire survey be made, under the auspices of the Conference, to gather from system users pertinent data on the factors that are outlined in our proposed statement of the area, in advance of the Conference itself. Such a survey would assure coverage of systems that might otherwise be overlooked in the solicitation of papers, as well as providing basic material of important interest to the working party for Area 4. Such material should also be useful to the working parties for Areas 5 and 6.

RECOMMENDATIONS FOR PAPERS

It is recommended that papers on the description of storage and search systems currently in use should include consideration of both those using manual methods and those using mechanized techniques, and should reflect the differing needs of different types of users — from the individual scholar to the largest library center.

Specific papers on mechanized systems that are actually in use at the time of the preparation of the paper, papers on the comparative evaluation of two or more systems, and papers on the development of criteria for comparative evaluation are especially invited.

## AREA 5

*Organization of knowledge for storage and retrospective search: intellectual problems and equipment considerations in the design of new systems.*

PROPOSED DEFINITIVE STATEMENT: SCOPE OF THE GENERAL AREA

Systems and procedures for storing and searching recorded knowledge are designed for the purpose of making the information available when needed. Such systems are often rendered complex by the requirement that information is to be drawn from a variety of sources and also by the fact that in some instances systems must provide both for the recall of individual facts and for their effective correlation. This area is concerned with the design of effective systems, with the problems encountered in processing recorded information for subsequent search, and with the possibilities of using machines or devices in the processing, storage, and search operations.

The effective organization of recorded knowledge requires more understanding than we now have of the relationships between scientific concepts and the words and other symbols in which they are described or expressed. The processing of information for retrospective searching must also take into account various practical considerations such as the purpose to be served, the capabilities of equipment that is already available or that could be constructed by exploiting present-day technological possibilities, and the costs involved in applying the various methods of processing information.

We must consider not only the effectiveness of traditional procedures, such as alphabetical indexing and hierarchical classification, but also recent experimental work and research trends directed toward the development of new or modified methods of indexing or organizing material as well as the development of equipment to aid in the rapid processing and searching of information.

PRINCIPAL SUBJECTS OF DISCUSSION

The principal subjects of discussion might be grouped under the following headings:

1. Linguistics — Structure and meaning;
2. Problems encountered in the design and application of systems;
3. Application of machines in storage and search processes;
4. Comparative evaluation of experimental systems.

1. Linguistics — Structure and meaning

The relationships between scientific concepts and the words and symbols in which they are expressed may be highly complex because symbols are entities in their own right and frequently more than one concept is associated with a single symbol. It is necessary to consider the problems involved in defining the meanings of words and also the relationships between words whose scope of meaning is narrow and words of more generic significance. The possibility of making use of generic concepts in correlating recorded information is particularly worthy of attention. The knowledge and methodology of linguistic scientists might be examined also for contributions in the effort to deal with the problems that occur in attempting to organize information. It may be helpful to study the devices used in natural language for indicating relationships between words — devices such as word order, directional prepositions, and various types of syntactic structure.

2. Problems encountered in the design and application of systems

The question as to whether subject matter is to be

recorded for storage in the form of a total text, an abstract of that text, the key words selected from the text or some other form depends upon the type of service to be provided. Whether the information to be stored and later searched involves ideas or notions on the one hand or established facts on the other will influence the design of methods for organizing the subject matter and the selection of equipment to be used with the storage and search system. The problems encountered in designing and using the following types of indexing and classification schemes and the capabilities and limitations of the various schemes should be explored.

A. Conventional indexing

The word "index", according to Webster's dictionary, is sometimes used to denote "a directing sign or instrument," "that which points out; that which shows, indicates, manifests or discloses; a token or indication". Taken in this broad sense, the establishment and use of an index is essential in the retrieval and correlation of recorded knowledge.

In a narrower sense, the word "index" may be used to denote "a list, usually alphabetical, of topics, etc., in a book, giving the numbers of the pages where each subject is treated, and commonly placed at the end of the volume"; also "a similar list of references to a series of volumes, or literature in general, usually printed separately".

The basic question of how words are most effectively used to provide "directing signs" and also the possibilities of using equipment to facilitate the preparation and use of indexes should be considered.

B. Coordinate indexing

When a system of coordinate indexing is used, the key words are used as "coordinates" and in the searching process it is possible to search for any desired combination of these "coordinates" or index entries. Scientific inquiries are usually expressed in terms of multiple concepts arranged according to the inquirer's particular needs of the moment.

Various devices for storage and search can be used effectively with methods of coordinate indexing. The work of combining categories as needed to satisfy an inquiry is left to the machine or device. The high speed at which desired patterns can be detected is the basis for the usefulness of such equipment.

C. Indexes that specify relationships

Most conventional and coordinate indexing systems are based on key words gleaned from the scientific records to be stored. A combination of the key words and the explicitly-stated relationships between the words forms a telegraphic style abstract that gives the subject content of a document at a glance. The merits of such abstracts for indexing purposes, the methods of preparing and coding the abstracts, and characteristics of equipment needed to conduct searches when information is so organized need to be explored.

D. Classification

The broad purpose of classification is to draw together records that have common features of subject content. The growing number of scientific records has required the use of increasingly narrow subject divisions in classification schemes, meaning that finer distinctions must be made in analysing subject matter and that the task of identifying documents with common characteristics has become more and more complicated. Broad classification schemes that attempt to cover all knowledge are being supplemented or even supplanted by specialized classification systems covering relatively narrow areas of subject matter. The use of carefully prepared specialized classification schemes or of a multiplicity of such specialized schemes may be very effective in organizing information for subsequent searching.

3. Application of machines in storage and search processes

The type of information stored and the types of questions to be directed to the stored record determine the methods to be used and the kind of equipment that will be selected for a given system. It is sometimes desirable to perform some operations on the information stored in the record, such as determining connections or relations between items. On the other hand, it is sometimes sufficient merely to recognize the presence or absence of items of information of or combinations of items recorded as such. Consideration needs to be given to general characteristics, capabilities, and limitations of the various types of equipment, including examples of such equipment now available which have not been exploited to full advantage.

Reviewing the stored record, re-arranging the subject matter, and continually expediting searches can be accomplished mechanically as machines "learn" by experience. Feedback can be employed to establish search priorities, optimum search patterns, and so forth. The mechanics of conducting such maintenance steps should be considered here, and the experience of others who use automatic data-processing equipment should be examined for applicable techniques.

During the searching operation, it is possible to use the answers that first result from the search to direct further searching. This can be a simple process of counting the items yielded by various modifications of the original question, and analysis of the results of such counting to guide additional searchings. On the other hand, auxiliary memory devices can be used with the searching equipment — devices capable of looking for associated items, of recognizing the frequency of occurrence of such associations, and of changing the direction of the search while it is going on. The techniques of searching, the development of search strategy, and the practical problems of conducting searches should be examined here.

In all the discussions of this problem area, emphasis needs to be placed on total information systems, methods as well as equipment. Experiences within particular situations need to be discussed in terms of their applicability to the problems of other situations.

It should be borne in mind also that machines can be used most effectively to prepare statistical ana-

lyses of a given body of information and that such analyses could be most helpful in determining the best method for the mechanized handling of that information. First a statistically meaningful sample must be selected from the total body of information. It should then be analyzed in various ways for its characteristics, such as the frequency of occurrence of certain kinds of information or the frequency of occurrence of certain combinations of items. The methods of employing present equipment, or the requirements for new equipment, to conduct such statistical analyses have not yet been fully recognized. Research in the field of mechanical translation offers one example of the use of such analytical methods in designing mechanized information systems.

4. Evaluation of experimental systems

It appears that persons and groups who are engaged in the development of systems embodying new principles for organizing subject matter could effectively compare their systems by applying them to a common set of documents. This may be a small sample, to be agreed upon by the cooperating investigators. It is suggested that the papers from the August 1955 Conference at Geneva, on peaceful uses of atomic energy, might constitute a useful sample. Use of the same sample for all systems would make comparison and evaluation easier. The systems should be discussed in terms of:

1. Size of the file to be covered;
2. Rate of growth of file and system;
3. Range of inquiries to be serviced, or the purpose to be served;
4. Range of subject matter to be covered;
5. Kinds of concepts to be represented;
6. Specificity and type of analysis;
7. Personnel required to do the analysis;
8. Cost of processing information and conducting searches;
9. Reliability of results, or probability of retrieval;
10. Form of system.

It is recognized that discussions in this problem area cannot be as factual as the descriptions of systems in actual operation could be. But the discussions should be practical and point out capabilities and limitations of the systems insofar as they can be determined.

5. Papers on the bearing of studies in linguistics on storage and search systems, papers on problems encountered in the design and application of systems, papers on the application of machines in storage and search processes, and papers evaluating experimental systems are especially invited.

## AREA 6

*Organization of information for storage and retrospective search: possibility for a general theory of storage and search.*

The importance of formulating a general theory to describe systems for the storage of information and subsequent search for retrieval justifies an investigation of the assumption that storage and search systems have enough in common to enable the development of a general theory. Without such a theory our efforts are directed to the empirical description of different devices which happen to get developed.

But when we attempt to develop a general theory, our research is directed towards the discovery of common characteristics, common methods of functioning, common purposes, and common types of logical organization. When these common notions have been isolated and defined, it should be possible to account for the difference between the various systems and devices in quantitative rather than qualitative terms.

It follows that the first work to be done is the identification of a group of concepts which have a common relevance to all storage and retrieval systems. As examples of such concepts we can suggest: A. relatedness or connectivity of documents in a collection along with a suitable metric to define the degree of relatedness; B. storage space requirements; C. number of dimensions of access to a file; D. access time; E. coding efficiency. Hence it would be appropriate, in Area 6, to have papers that isolate and define such common parameters of storage and retrieval systems. It would be highly desirable if reasonable models of retrieval systems could be set up and analyzed, and if similarities between these models and models of different kinds of systems that have already been studied could be exploited. In this way it might be possible to make use of techniques that already exist in such studies as linguistics and information theory.

It is to be hoped that the search for quantitative relations among the basic concepts and the achievement of a theory of storage and retrieval systems will be able to predict new properties of such systems. If this can be done, any attempt at experimental verification of these properties would be an appropriate topic for papers, as would be any experimental investigation of the reasonableness of the fundamental postulates of the theory.

Thus we have three sub-areas for papers in this general area:

1. Papers concerned with identifying, describing, and relating the basic concepts in the field of storage and retrieval theory.
2. Papers concerned with formal techniques of analyzing such systems.
3. Papers concerned with the systematic mathematical development and experimental verification of the theory. Perhaps it may be too ambitious to expect papers in the third area until work has gone forward in the other two.

## AREA 7

*Responsibilities of governmental bodies, professional societies, universities, and research and industrial organizations to provide improved information services and to promote research in documentation.*

1. The task of developing and maintaining effective scientific information services is of such magnitude as to require the resources and cooperation of all organizations with an interest in the progress of science. To varying degrees, governments throughout the world have undertaken to provide, or contribute support to, information centers and services; professional societies and industrial organizations have been active in fostering interest in and support of documentation work in their respective fields. A study of these various programs and the results achieved should furnish important clues as to the other problems involved, the areas in which greater attention is most desirable, the effects of financial support on the character of the services, and the directions in which further probing would seem to offer the highest dividends.

2. Compared to the level of production of new scientific information, research on the organization and use of scientific information is now very limited, The belief is widely held that whatever may be the current level of support for scientific information services as such, significant improvements in their effectiveness are not likely to be achieved unless a vastly increased amount of research and development is undertaken in these fields. Accordingly, the following questions need to be asked: If, because of the size of the problem, we must look to national governments predominantly for support, what residual responsibilities remain with the professional societies? Should they not be expected to contribute by identifying the scientific and professional problems (and needs) involved, and to suggest avenues to their solution? Although the professional societies are necessarily concerned with current publication of the results of current research, should they not also be more concerned than at present with assuring the availability of the past literature through the tools of retrospective search? In addition, what is needed to provide unity in documentation research and to overcome present scattering of effort? How can the individual operations of publication, indexing, microfilming, and so forth be brought together and recognized as parts of a whole? How can the professional societies in the various subject disciplines contribute special insights into special problems which may well illuminate fundamental documentational principles in still other disciplines?

3. In addition to the problems relating to the support of effective scientific information services, and to the problems related to research and development regarding such services, a third problem area may be identified. This is the area of training for activity in scientific documentation work — either in the production of services themselves, or in research to promote their efficiency. We need a survey of the training facilities now available as a basis for calculating the additional facilities required to meet current and future needs.

SUGGESTIONS FOR PAPERS

1. Differences in various national and international arrangements for financial support of science information services: Relationship of the supporting organizations to such services.
2. Conditions and methods necessary for promoting research on organization and use of scientific information and on the problems of scientific documentation.
3. Implications, for training, of the requirements of the science information services and of the needs for research in the problems of scientific documentation.

*All requests for further information about the Conference should be addressed to the Executive Secretary, Dr. Alberto F. Thompson, International Conference on Scientific Information, National Academy of Sciences-National Research Council, 2101 Constitution Avenue, Washington 25, D.C. USA.*